The 399th Geodynamics Seminar

Diffusion of hydrogen in Forsterite

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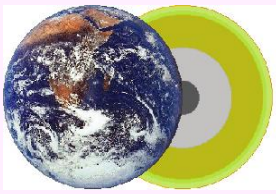
Date: 10.24.2014 (Fri) 16:30 ~
Venu: Meeting Room #486, Science Research Bldg 1, Ehime Univ.

日時：2014年10月24日(金)16:30～
場所：愛媛大学 総合研究棟Ⅰ 4階共通会議室



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Abstract

Presence of aqueous fluids in the Earth's mantle wedge has been discussed. The aqueous fluids have a major effect on physical and chemical properties of the rocks in the Earth's upper mantle such as viscosity, elastic wave velocity and melting temperature. Fluid transport is considered to be controlled by infiltration and diffusion, and, in diffusion, lattice diffusion and grain-boundary diffusion act independently. There are some previous studies on diffusion of hydrogen in olivine, which is a major constituent mineral in the upper mantle. According to the previous studies in mantle minerals, diffusion of hydrogen is much faster than those of other elements, and two different mechanisms exist in the diffusion in which different types of defects are rate-limiting. However previous studies employed gas medium pressure vessel or piston-cylinder apparatus and their pressure conditions are limited to relatively low pressures. In this study, I performed annealing experiments on single crystal forsterite using multi-anvil apparatus at pressure of 3 GPa and temperature of 1050-1300℃, and the hydrogen distribution in the sample was investigated using Fourier transform infrared spectroscopy to determine the diffusion coefficient of hydrogen at high pressure and high temperature. This results show that the diffusion length of hydrogen in forsterite is significantly shorter than that of previous study at same temperature presumably due to pressure effect.

詳細は当センターホームページ：http://www.ehime-u.ac.jp/~grc/をご覧ください
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